

NESDIS Snowfall Rate (SFR) Quick Guide by NASA/SPoRT

What is the NESDIS SFR product?

The NESDIS snowfall rate (SFR) product is derived using passive microwave measurements taken from the Advanced Technology Microwave Sounder (ATMS) aboard Suomi-NPP and Advanced Microwave Sounding Unit (AMSU)/Microwave Humidity Sounder (MHS) aboard a suite of four NOAA and EUMETSAT polar-orbiting satellites. The product has a spatial resolution of approximately 16-km at nadir. The microwave signal is able to penetrate clouds, hence bearing the signatures of the snow inside and beneath the clouds.

What are its advantages?

The SFR product provides a unique, space-based perspective on the locations of frozen precipitation that can be used to easily identify the extent of a snowstorm and the location of the most intense snowfall. These two features might not be readily apparent from traditional IR or VIS satellite imagery or radar.

SFR is most valuable in filling observational gaps in mountains and remote regions where weather stations are sparse and radar blockage and overshooting are common. The SFR algorithm uses multiple channels that are sensitive to different atmospheric levels in order to sample the intensity of snowfall through the entire precipitation layer. This provides an advantage over ground-based radar, which scans single vertical levels and may miss higher concentrations of precipitation above or below the scan of the beam.

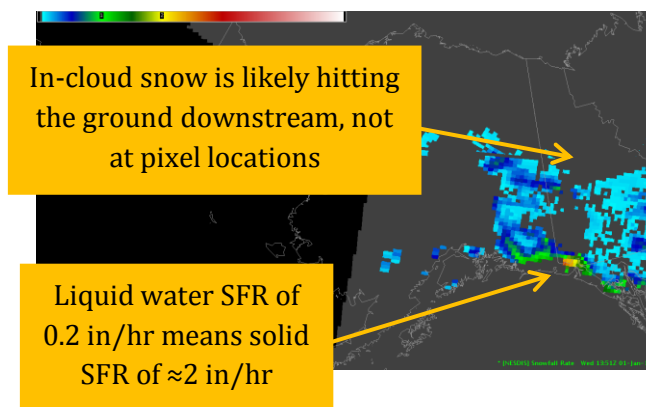
When and how often is it available?

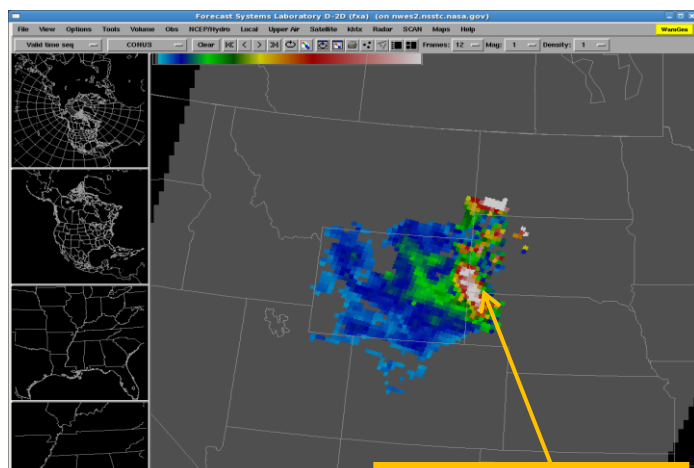
Currently, the five polar-orbiting satellites provide close to 50 swaths per day in the polar regions. The timing of the overpasses is such that it provides nearly hour observations for much of Alaska. ATMS data are processed in near-real-time using data obtained from the GINA direct broadcast. Products

from the other sensors are processed in a real-time capacity at NOAA/NESDIS with a product latency of 30 minutes to 3 hours depending on the satellite orbit.

What should I be aware of when interpreting?

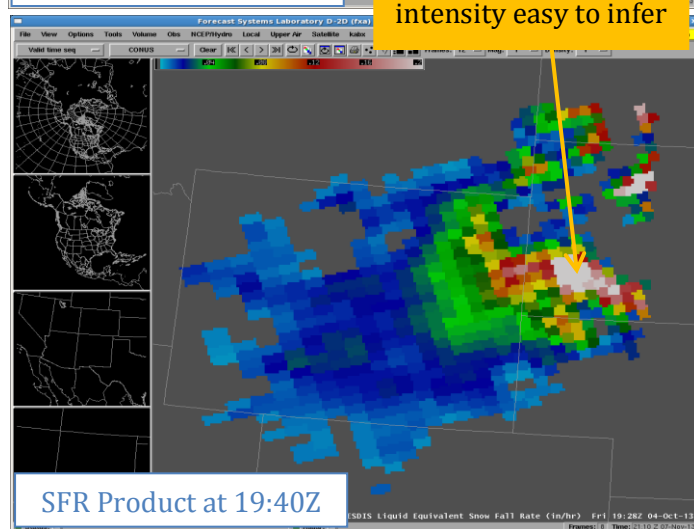
- **It's liquid:** This is a water-equivalent SFR product. To convert it to solid SFR, forecasters will need to multiply by an appropriate snow-to-liquid ratio based on local climatology and environmental conditions at the time of the snowfall. The maximum SFR detected by the product is 0.2 in/hour (liquid).
- **Not ground snow:** The SFR product detects snowfall in the entire precipitation layer, which often does not directly translate to accumulating snowfall on the ground at a specific pixel location. Due to the slow terminal velocity of snow particles, there usually is a time lag between the retrieved snow and that same snow reaching the ground. Thus, there may be instances where high SFR is not associated with heavy snow at ground level.
- **Over land:** The current SFR product is only retrieved over land due to limitations of available observations over water to train the dataset.
- **Not too cold:** The SFR product is limited to regions where the surface air temperature is about 7°F and above.





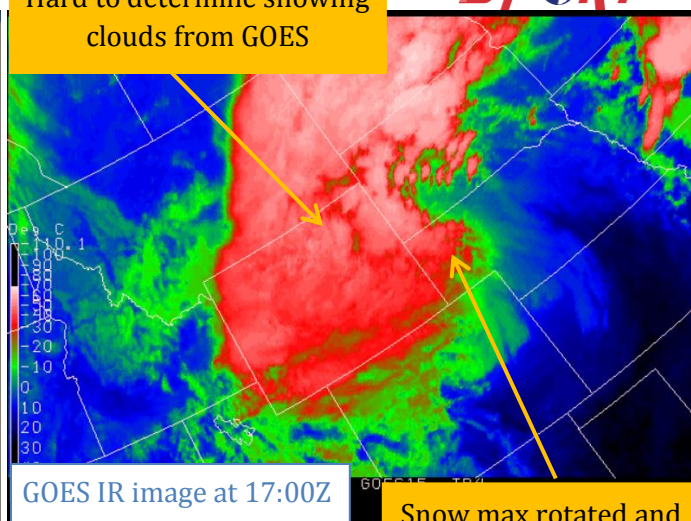
SFR Product at 17:05Z

Snow edge and max intensity easy to infer



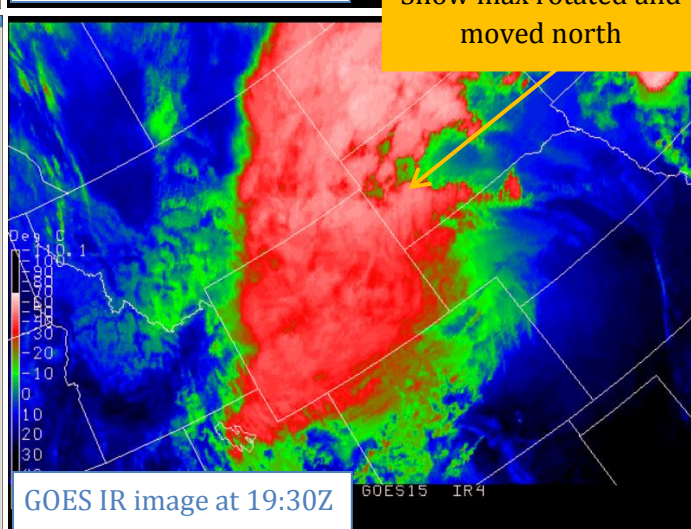
SFR Product at 19:40Z

Hard to determine snowing clouds from GOES



GOES IR image at 17:00Z

Snow max rotated and moved north



GOES IR image at 19:30Z

How do I use the SFR Product?

The SFR product should be used to gain additional insight into cloud and precipitation features detected on radar and GOES satellite. Because the SFR product is derived from polar-orbiting satellites, the product cannot be looped like radar or GOES imagery. However, this product has the advantage of adding quantitative information not available from these data sources.

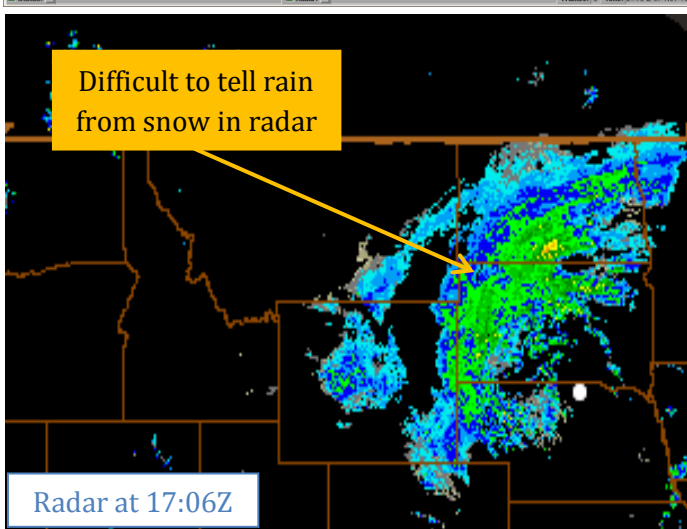
The radar image to the left shows a perspective of a snowstorm from 4 October 2013 over the Northern Plains at 17:06Z. From the image, it is difficult to delineate snow from rain or determine the regions where

the snowfall is heaviest. However, the SFR product makes it easy to identify the edge of the snowfall and area of maximum intensity.

Once this feature is identified, the forecaster can then use the radar or GOES imagery to track the snowfall edge and maximum until the next SFR overpass. In the case above, the maximum rotated to the north over a two-hour period. The product may be able to track features in higher latitudes due to higher overpass frequency.

Last modified October 2014

(see reverse side)



Radar at 17:06Z

Difficult to tell rain from snow in radar